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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

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DISEASES of the NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

Western Equine Encephalitis

(The 1949 Epidemic in Colorado)

DONALD W. MULDER, M.D.
Rochester, Minnesota

Western equine encephalitis has occurred in epidemic frequency in the Rocky Mountain area on several occasions during the past two decades.[1,2] The diagnosis of this severe and often fatal disease is seldom made in an early stage. Thus, a serious epidemic of Western equine encephalitis occurring in northeastern Colorado in the summer of 1949 was not recognized until relatively late in the course of the epidemic because many of the patients were originally thought to have an atypical form of poliomyelitis. During this epidemic it was possible to observe and treat 25 patients with this illness who were admitted to the hospitals affiliated with the University of Colorado Medical Center. The diagnosis in these cases has since been confirmed by clinical study, by postmortem findings in 3 cases, and by serum neutralization studies in 20 cases (Table 1). Because of the apparent lack of awareness of the signs and symptoms of this severe illness, it seemed desirable to summarize the salient features observed in these 25 cases.

Western equine encephalitis is an acute specific infectious disease caused by a virus that produces specific antibodies, characterized by involvement of the central nervous system with encephalomyelitis, and often followed by severe residuals indicative of damage to the central nervous system. This disease has been observed for many years in epidemic form among horses. It was not until 1932 that Meyer[3] identified the virus, and in 1933, suggested that this virus might cause a similar infection in man. In 1938, Howitt[4] was able to recover the virus from the brain of a patient who died of the illness. Since then a number of extensive epidemics have been observed. Hammon[5] and others have demonstrated that the mosquito, Culex tarsalis, has in certain instances proved to be a vector while fowl may be an important reservoir. In Colorado, Black, Absher and McDonald[6] demonstrated the presence of Culex tarsalis in the river valleys and irrigated areas below 6.000 feet.

Diagnosis

Diagnosis is confirmed in a suspected case by serum neutralization, complement fixation tests, or by isolation of the virus. Western equine virus has been isolated from blood and spinal fluid in rare instances. The virus[7] is most frequently isolated from the brain or spinal cord of patients dying early in the course of their illness. According to Sabin,[8] the ideal goal "in establishing by serological methods that a given infection of the nervous system is caused by a specific virus, has been to have a serum taken early enough in the disease to be without any antibodies of the virus and another serum taken at a later stage when such antibodies can be demonstrated unequivocally." In five of the patients included in the present series, the original specimens of serum were obtained early enough in the course of the illness to be without any antibodies for the virus. Subsequent serum revealed anti-

body titers varying from 100 to 1,000. No complement fixation tests were obtained. An attempt to isolate the virus from the brain tissue in two of the fatal cases was not successful.

Clinical Syndromes.—This epidemic occurred during the latter part of August and the early part of September, 1949. This coincided with a moderately severe epidemic of poliomyelitis which overlapped it so that cases of poliomyelitis occurred in considerable numbers over a greater period of time. For this reason the diagnosis of encephalitis was seldom considered and in most instances the cases encountered were initially diagnosed as acute anterior poliomyelitis and the patients transferred to a poliomyelitis center. The patients presented, in general, two clinical syndromes. The symptoms of these two groups varied sufficiently to occasion considerable confusion and it is felt that they warrant individual description. The first group consisted of young children from one to six months of age who suffered from a brief acute illness. The second group consisted mainly of adult males, principally farm laborers, in whom the symptoms and findings of the illness were severe and prolonged. As in other virus epidemics, there were also patients in whom the symptoms were minimal and could not be differentiated from the symptoms of other mild neurotropic diseases of the central nervous system. Although the actual number of these patients in this series was few, it is believed that more widespread use of available diagnostic procedures would have revealed a great many patients with a mild form of the illness.

The infantile form of the illness was diagnosed four times in the series. All of the infants were under 12 weeks of age. The clinical courses of these four patients were remarkably similar. They all were admitted because of high fever and continuous convulsions which began abruptly and did not respond to the usual therapy. The convulsive movements were continuous, beginning primarily in one extremity from which they spread to include the entire body. The convulsions were preceded by and associated with increased temperature which persisted three to seven days and ranged from 104° F. to 106° F. The fever and convulsions then abruptly disappeared and the patient became asymptomatic. Examination during the acute episode revealed an acutely ill, febrile child with abnormal neurologic findings. The deep reflexes were more active in the extremity from which the convulsive movements spread. Cogwheel rigidity was present and was most marked in the affected side. Nuchal rigidity was a prominent finding and in a few instances opisthotonos was noted. The abnormalities of the spinal fluid were the same in the infantile form as in other forms of the illness and will be discussed later.

In the adult group there was considerable variation in the severity of clinical symptoms. A common pattern, however, could be recognized in all of the adult patients. The illness began in most instances with fever, chills and malaise. These symptoms were soon followed by a headache which was described as severe, persistent and prostrating. In patients with a mild illness, headache was the only prominent finding. More frequently it was observed that the headache was accompanied by drowsiness and in some instances by coma. The patient, if awakened, might still complain of headache but would fall asleep while expressing his anguish over the pain. This disturbance in the level of consciousness was a constant finding in the severely ill patient. It varied from patients in whom it was manifested by a slight increase in drowsiness to others who remained in coma for weeks. At times the accompanying disturbance in awareness and perception was associated with considerable anxiety and delirium. Less severe symptoms included pain in the back, nausea and vomiting. The pain in the back was prominent early in the course of the illness but was seldom mentioned by the patients because of the severity of headache. Vomiting constituted a serious threat to the comatose patient who frequently aspirated vomitus.

Physical findings were scant and frequently variable in patients with a milder form of this illness. Nuchal rigidity was found in all patients during the acute illness. In those patients more severely ill, tremor, dysarthria and paralysis or paresis occurred.

Tremor occurred most characteristically about the mouth and in the upper extremities. At times its presence in the upper extremities was associated with typical cogwheel rigidity. Dysarthria was present in most of the severely ill patients and was frequently progressive. Speech became unintelligible in some patients because of a loss of volume and quality of the voice. Paralysis and weakness, when present, was not patchy and flaccid in character as in poliomyelitis. It usually involved either one side of the body or both, and in none of the patients described in this series was it complete. It was associated with an increase in muscle tone, hyperactive reflexes and abnormal plantar responses. In some instances there was evidence of involvement of the central control of autonomic function which in one patient was demonstrated by a persistently low fever which did not exceed 96° F. in the 48 hours prior to death. In two of the patients included in this series, respiratory arrest occurred and necessitated the use of a respirator. One of these patients survived her acute illness and made an uneventful recovery. Eye symptoms which are common in epidemic encephalitis were noted infrequently. Convulsive episodes, when they did occur in the adult group, seemed related to anoxia.

Laboratory Data.—The cerebrospinal fluid findings were similar in all of the patients. Examination of the fluid during the first few days of illness revealed a mild increase in pressure, increased cell counts ranging from 25 to 600 per cubic millimeter, the majority of which were polymorphonuclear cells, and increased concentration of sugar and protein. Examinations of the spinal fluid during the second week of the illness demonstrated a pleocytosis with a preponderance of lymphocytes and an increase in the total protein. In a few cases, five to ten per cent of the cells found in the spinal fluid were large mononuclear cells. These have been described previously by Adamson and Dubo[9] as characteristic of Western equine encephalitis. Blood leukocyte counts made during the acute infection revealed a mild leukocytosis. Other laboratory studies, except for the neutralization tests, were noncontributory.

Outcome of the Disease and Postmortem Features

Death occurred in 12 per cent of the cases in this epidemic, usually in the first 48 to 96 hours, from a fulminating type of infection. In other epidemics the mortality rate has been described as ranging from three to 20[1] per cent, and death as particularly common in the case of comatose patients. Postmortem examination in the three cases in which death occurred in the present series was conducted by Dr. Karl Neuberger. He reported that the leptomeninges showed mild lymphocytic infiltration. The cerebral cortex displayed comparatively slight involvement. The cerebral white matter showed scattered small patches of early perivenous disintegration of myelin with a few infiltrate cells around the vessels and with marked microgliosis. In the extracortical cerebral gray matter, especially in the striatum, the lesions were greatly accentuated. Many small microglial nodules were observed, consisting of loosely aggregated cells with oval, sausage-shaped or dumbbell-shaped nuclei, intermingled with a few rod cells. In some instances mitotic figures were noted, and occasionally they were surrounded by proliferated astrocytes. Many of the striatal neurons had degenerated or disappeared. There was a diffuse overgrowth of plasmatic glia in wide zones. Essentially identical changes were observed in the substantia nigra. This was attended by early degeneration of a number of melanin cells with scattering of pigment and with occasional neuronophagia. A few small patches of complete necrosis were encountered in the midbrain. Neuronal degeneration and gliosis were found, to a lesser extent, in the red nucleus and the corpus of Luys. The involvement of the pons and medulla was less marked; there was mild patchy and diffuse gliosis in the dorsal nuclei of the medulla, along with slight perivascular infiltration. The cerebellar cortex appeared fairly normal; the white matter exhibited changes resembling those in the cerebrum, and the dentate and olivary nucleus showed rather marked participation in the inflammatory changes. The spinal cord was incompletely examined but appeared to be free from noteworthy alterations.

Convalescence was prolonged in the adult group, and in most of the patients recovery occurred only after three to four months. In the infantile group, recovery, if it did occur, was complete in a few weeks. Fifteen of the patients were followed six to eight months in an attempt to evaluate possible residuals. The sequelae observed in these 15 patients have been reported previously.[10] The three infants who were followed demonstrated an inability to use one side of the body as well as the other, and one continued to have focal convulsions. The severity of sequelae in the 12 adults who were followed seemed directly related to the duration of coma experienced. The sequelae were manifested by rigidity, speech difficulty, facial masking, loss of weight, and organic impairment of psychologic functioning. Sequelae were minimal or nonexistent in three of the adults, mild in three and severe in six. Three of the patients with severe symptoms were rehospitalized.

Treatment and Prevention

Treatment for Western equine encephalitis remains symptomatic as there is now no specific therapy for this virus. Supportive therapy is of great value and in many instances is lifesaving. This is particularly true in the severely ill, stuporous or comatose patient. In the comatose patient it is essential that the airway be maintained; the patient should be turned frequently and the throat should be aspirated when necessary. During the acute phase of the illness, oxygen therapy may be indicated. In some instances it may become necessary to perform a tracheotomy and occasionally the use of a respirator is indicated. In the acute period of the illness it will be necessary to maintain an adequate intake of fluid, parenterally if necessary. Once the acute symptoms have subsided, particularly after the period of vomiting has passed, a tube may be inserted through the nose and into the stomach to provide a satisfactory means for giving the needed fluid and nourishment. Urinary retention or incontinence can usually be guarded against by the use of an indwelling catheter, which will greatly simplify the care of the incontinent patient. In the severely ill patient, penicillin is indicated in adequate doses as a prophylactic against secondary infections. As Hammon[5] has pointed out, the physician is apparently unable at present to control or help the patient during the acute phase of his illness. He can, however, do a great deal if the patient is able to survive the first ninety-six hours, and even in the presence of prolonged coma one may expect him to recover, although not without residuals.

Preventive measures which have proved effective include the use of vaccine and mosquito control.[7] Vaccines have been prepared commercially for human use and have been used on laboratory workers. In most epidemics the morbidity rates have been low; for this reason, mass immunization is not indicated. Communities in an endemic area should attempt mosquito control, and the individual should adopt all available methods known to prevent mosquito bites.

Differential Diagnosis

The diagnosis of acute encephalitis can be made with considerable assurance on the basis of clinical and spinal fluid findings. An acute febrile illness accompanied with severe headache, coma, and an increase of mononuclear cells and sugar in the cerebrospinal fluid is pathognomonic, especially if it occurs in an epidemic setting. The specific type of encephalitis can be determined only by serologic tests or isolation and identification of the virus. In the Rocky Mountain area, Western equine encephalitis, St. Louis encephalitis and epidemic encephalitis have been described. The close relationship, both clinically and epidemiologically, of Western equine encephalitis and St. Louis encephalitis make clinical differentiation both difficult and somewhat academic. Epidemic encephalitis is now reported so sporadically and infrequently that one need not consider it seriously. Mumps encephalitis, lymphocytic choriomeningitis, and the encephalitis occasionally associated with infectious mononucleosis can be differentiated by clinical findings and specific serologic tests.

Poliomyelitis, because of its frequent simultaneous occurrence and greater notoriety, is often confused with Western equine encephalitis. In an abortive case of either disease, the symptoms may be quite similar.

The age incidence of the two illnesses is dissimilar, however, with poliomyelitis occurring more frequently in adolescence and Western equine encephalitis most frequently in infancy and in adults. The characteristic flaccid paralysis of acute poliomyelitis is never duplicated in Western equine encephalitis and weakness, when present, is associated with increase in muscle tone and hyperactive reflexes. Drowsiness and coma, common and almost universal symptoms in acute Western equine encephalitis, are found only terminally or with anoxia in poliomyelitis.

The bacterial infections of the central nervous system (meningitis, abscess, sinus thrombosis, and so forth) may be differentiated by history, clinical findings and by spinal fluid examinations with appropriate smears and cultures. Occasionally syphilis, typhoid fever, cerebrovascular accidents, tumors, and the so-called febrile convulsions of childhood present difficulties. Syphilis and typhoid fever may be differentiated by proper serologic tests. Cerebrovascular accidents and tumor can be eliminated on the basis of an adequate history with the characteristic spinal fluid findings. Febrile convulsions in infants can be differentiated by their relatively short duration and the absence of spinal fluid changes.

Summary

Western equine encephalitis is an acute epidemic virus infection of the central nervous system occurring during the late summer and frequently confused with poliomyelitis. The clinical course and residuals of this illness vary sufficiently from the latter disease to necessitate differentiation for proper treatment and prognosis. In infancy it is characterized by an abrupt onset with coma and convulsions. The clinical symptoms in adults include headache, drowsiness, coma and tremor. Both in infancy and in adult life there are spinal fluid changes characterized by a mononuclear pleocytosis and a moderate increase in protein. Sequelae observed have been severe and frequent.

Author's Note: The studies on which the foregoing report is made were done at the University of Colorado Medical Center, Denver, Colorado, where the author was then Assistant Professor of Neurology.

TABLE 1

Results of Neutralization Tests for Western Equine Encephalitis, Colorado, 1949

Case	Age, yr.	Sex	Test for Western equine encephalitis: Day after onset serum obtained	Intracerebral neutralization index
1	10 wk.	M	18	32
			40	46
2	10 wk.	M	10	32
			15	100
3	10 wk.	M	14	100
4	7 wk.	M	10	187
5	53	F	No serum obtained	
6	58	M	No serum obtained	
7	31	M	12	187
			24	320
8	31	M	6	0
			30	100
			48	187
9	54	F	21	54
			32	320
10	53	M	7	0
			25	678
11	38	M	15	100
			23	320
			37	187
12	52	F	5	0
			33	1,000
			53	320
13	55	M	10	678
			33	320
14	20	M	16	100
			22	320
			34	320
15	25	M	8	100
16	17	M	14	320
			31	678
			45	187
17	23	M	8	32
18	22	M	5	0
			22	100
19	52	F	Patient died	
20	39	M	10	678
			40	678
21	20	M	7	0
			25	187
			50	187
22	27	M	10	32
			50	320
23	25	F	12	100
24	60	M	Patient died	
25	54	M	Patient died	

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Differential Cerebral Stimulation

GERHARD HIRSCHFELD, M.D., and JOSEPH BELL, M.D.
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This is a preliminary report in a study of a flexible method of electro-therapy, which we have termed "Differential Cerebral Stimulation."

For our investigation we utilized a brief stimuli square wave current (Liberson) with variable peak, pulse duration and frequency. Increasing intensities of current seem to embrace different levels of integration within the brain. Accordingly, we are able to distinguish four stages of electro-therapy, each stage differing in neurophysiologic and clinical effect. In addition, variation of frequency apparently influences the manifestations observed.

First Stage:

a) *Method:*

This stage is identical to non-convulsive electro-stimulation, about which one of the authors (G.H.) reported in earlier papers. Electrodes are applied bilaterally in the temporo-parietal region, about one inch above the ear. An assumed connecting line between both electrodes would pass through the diencephalon. A unidirectional square wave current with a peak of 80 milliamperes, pulse duration of 0.3 milli-seconds and a frequency of 120 is utilized. The average current meter reading gives a value of about 2 milliamperes. Of late, we have interrupted the current about 25 times per second, with the help of an electric interruptor. Due to the principle of summation, the same effects are obtained with smaller total energies. As consciousness is not impaired during passage of current, pain is experienced. For that reason, patients require intravenous administration of 5 per cent solution of Pentothal Sodium prior to treatment. The effect of variation of frequency will not be discussed at present as insufficient data have been accumulated thus far.

b) *Neurophysiologic Manifestations.*

No convulsion or other motor phenomenon is observed. Patients remain completely relaxed and breathe quietly throughout. An autonomic response of a predominant sympathetic nature is present, manifested by perspiration, stimulation of erector-pili muscles, flushing and moderate quickening of pulse rate. Pupils are widely dilated in most cases. Patients, however, who are emotionally flattened do not as a rule show autonomic excitation. For treatment purposes, current is applied continuously from two to four minutes.

c) *Clinical Effects and Indications.*

Many patients show a profound emotional excitation immediately following stimulation. The degree of excitation is related to

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the length and strength of electric stimulus. Three basic emotional patterns have been observed: Crying, rage and laughter (rarely). Crying and rage are frequently intermingled. During these excitatory states patients may discharge a large amount of hostility and feelings of guilt. Frequently, patients relive traumatic experiences of the past. One of our patients, for instance, went through the experience of his ship sinking, during which he discharged much guilt feeling pertaining to the drowning of one of his buddies. Another found himself trapped in the jungles and surrounded by Japanese. All of these events happened five to eight years before, and had been "forgotten." The only indications that some kind of emotional disturbance apparently persisted within the patient were nightmares, severe anxiety and phobias. We prefer to call these excitations "emotional release phenomena." Frequently, an emotional release does not occur until twenty or more treatments have been given. At first, patients will report an increased feeling of hostility following a treatment. After a few more days, they will finally break through with rage or crying reactions. If Pentothal Sodium is given without subsequent stimulation, no release phenomena are observed as a rule. We believe that the effect is due to an increased emotional pressure although Pentothal Sodium facilitates the emotional release. The first stage of electro-therapy (electric-stimulation) is indicated in certain types of anxiety and its various manifestations, such as somatization. Anxieties accompanied by feelings of guilt and by depressive features, however, become more pronounced with first stage electro-therapy. Paranoid schizophrenics who have maintained good contact with reality and have preserved their affect also show satisfactory response.

Its use is further indicated in all states of depressed brain activity, such as in barbiturate coma, asphyxiation, respiratory arrest during anesthesia. Its usefulness in psychosomatic conditions is being explored. Treatments are given on a daily basis and as many as thirty to sixty are usually required.

Second Stage:

a) *Method.*

Increase of the same current to about 250 milliamperes peak with the same electrode position results in a tonic effect. The average current readings give a value of about 10 milliamperes. Since respiration is suppressed during the tonic state, the current has to be lowered periodically to permit breathing. We maintain tonus for about 15 seconds, reduce the current and then restore a tonus. This is repeated five to six times during one treatment.

b) *Neurophysiologic Manifestations.*

The tonic stage resembles a decorticate rigidity. The arms are flexed over the chest and the hands show a carpopedal spasm. The legs are held rigidly in extension. No Babinski sign can be elicited. The back is arched slightly. Neck muscles are rigid and eyeballs show conjugate deviation. Autonomic response is more profuse than during the first stage. The tonic effect apparently is not due to cortical ablation (electro-ablation) as patients maintain full consciousness. They are able to hear, comprehend and perform mental tasks although they cannot speak, due to muscle spasm. Because of the pain involved, administration of Pentothal Sodium is required.

c) *Clinical Effect and Indications.*

As in Stage 1, we observe emotional excitations following treatment. However, these excitations are frequently more pronounced which, apparently, is due to the stronger stimulatory effect of the increased current. The therapeutic range of the second stage has not yet been worked out fully. More severe cases of anxiety and of paranoid schizophrenia, not responding to the first stage, will often improve under the second stage of electrotherapy. We had one patient with nihilistic delusions of many years duration who responded favorably to the second stage.

Third Stage:

a) *Method.*

This stage is identical to electric-shock. Current is raised to about 450 milliamperes peak, giving an average reading of about 15

milliamperes. The typical grand mal convulsion results. As a rule, following the clonic phase, we reduce the current to about 80 milliamperes peak and shift the electrodes somewhat anteriorly. From that position, a stimulating effect on respiration has been noted and in cases of apnea, breathing can readily be re-established by modulating the current between 80 and 200 milliamperes peak. It must be remembered that cortical respiratory centers have been described as being located at the orbital surface of the frontal lobes.

b) *Neurophysiologic Manifestations.*

We observe a typical grand mal convulsion consisting of a tonic phase followed by clonic movements. Patients go into the tonic phase gradually resulting in an extremely smooth convulsion characteristic for its absence of initial jerking.

The clonic phase can readily be suppressed by maintaining current at about 400 milliamperes peak and a tonic state will be observed throughout the convulsion. In cases of fragile bones or abnormalities of the spine such procedure might be useful.

c) *Clinical Effects.*

They are identical to those observed in convulsive therapy. However, there is less post-convulsive confusion and no memory impairment is noticed.

Fourth Stage:

a) *Method.*

The fourth stage is induced while the patient is in the tonic phase of the third stage. Current is raised from 450 milliamperes peak to 700 milliamperes peak, resulting in an average current reading of about 30 milliamperes. Electrodes at the same time are shifted somewhat anteriorly. Current is maintained at that level for two seconds, reduced to 200 milliamperes peak for a few seconds and raised again to 700 milliamperes peak. This procedure is repeated four or five times following which the same procedure as during stage three is carried out. As soon as respiration has been re-established electrodes are returned to the temporo-parietal position and with about 80 milliamperes peak treatments are continued for about three minutes. The latter procedure is identical to the first stage, although its effects and indications differ. No barbiturate is required during stages three and four. Lately we have in some cases been using a very low frequency of 20 per second with longer pulse duration of 1.5 milli-seconds. (Ordinarily a frequency of 120 to 240 per second is utilized.)

It seems that certain patients, especially if there is marked confusion or catatonia, do better on a low frequency. We are now attempting to evaluate the clinical effects of the various frequencies aside from pulse duration and wave peak. At this stage we are able to state that frequencies over 200 per second, up to about 500 per second give an extremely smooth convulsion, whereas lower frequencies seem to have a greater stimulating power on the autonomic nervous system apart from the possible beneficial effect of very low frequencies in certain confused and catatonic schizophrenics.

b) *Neurophysiologic Manifestations.*

During the fourth stage, the clonic stage of the convulsion is completely suppressed and patients present a tonic state with extensor spasm of the legs and flexor spasm of the arms. The back is arched and eyeballs show conjugate deviation. An autonomic response of predominantly sympathetic nature is present. If the fourth stage is followed by stage one, as described earlier, sympathetic stimulation will be increased manifold with profuse perspiration as seen in deep insulin coma. Many emotionally deteriorated patients however, do not show an autonomic response. As mentioned, low frequencies of about 20 per second with greater pulse duration seem to exert a somewhat greater stimulating power on the autonomic nervous system. In addition it was noticed that inhalation of oxygen during the first stage enhances the autonomic response.

c) *Clinical Effect and Indications.*

The fourth stage seems to differ in clinical and therapeutic effect from the third stage. We observed that some patients following the first few treatments showed considerable excitation not commonly observed with the third stage (electro-shock). We believe that this effect is due to loss of inhibitory functions; it is particularly observed in

withdrawn schizophrenics. Following therapy, these patients appear for a short period devoid of all restraint, shouting hilariously and shaking hands with everyone in sight. They appear friendly, lose their shyness in interpersonal relationship and participate in socializing activities. Intravenous Amytal Sodium often has a similar effect, which is believed to be due to abolition of inhibition. However, the effect of fourth stage electro-therapy is more prolonged.

We believe that the highest centers of mental integration are affected by the fourth stage. Schizophrenic patients report marked improvement of awareness and comment about the new brilliancy with which the outside world presents itself. They state that they can think with more ease and that a "fog" seems to have lifted from their mind. "For the first time I notice that the doctors, nurses and surroundings are real," is a frequent comment. They exhibit better planning ability and foresight. Their critical self evaluation improves and creative ability seems to be enhanced. There is most striking improvement in social relationship and empathy. Self consciousness, lack of confidence and feelings of inadequacy are diminished. In a few patients, however, we observed memory impairment and confusion following fourth stage electro-therapy, suggesting an organic syndrome such as is commonly seen with certain types of electric shock treatment. Fortunately, few patients were so affected. This suggests that we should procede with caution, and for the time being, stage four should not be used on an out-patient basis.

Stage four is usually followed by stage one. This procedure is particularly indicated in the treatment of disorganized and regressed schizophrenics. At times, such an approach is contra-indicated, as feelings pertaining to guilt, incest and homosexuality may become more pronounced and patients may be unable to cope with these disturbing thoughts. One patient for instance went through a typical homosexual panic when stage four was followed by stage one. Another developed marked ideas of incest. When these patients were given fourth stage electro-therapy alone, satisfactory clinical responses resulted.

Hoch and others described a syndrome called "Pseudo-neurotic-schizophrenia." We have treated several patients who might fit into that category. They showed mild paranoid trends, feelings of unreality, lack of power of concentration and tension with many neurotic defenses. All showed good affect. Such patients often do well on an alternating regime. Fourth stage electro-therapy is given three to four times on successive days. Patients as a rule will report an increase of tension and hostile feelings. If first stage electro-therapy is then given, many of such patients will show a strong emotional release with subsequent clinical improvement. We further found the fourth stage effective in patients whose outstanding symptoms were chronic agitation or strong guilt feelings. Some of these patients had previously received electric-shock (third stage) without effect.

Our observations thus far suggest that fourth stage electro-therapy seems of value in the more severe forms of schizophrenia which ordinarily do not respond satisfactorily to electric-shock (third stage). Some of our regressed schizophrenics seemed to revert to almost normal behavior after a few treatments, whereas previously they had not responded to ordinary electric-shock. Unfortunately many of them have relapsed on discontinuation of therapy. This suggests that the schizophrenic process can often be reversed and that at least temporarily the patient can be brought out of his psychosis with fourth stage electro-therapy.

Conclusions and Summary

Four stages of electro-therapy have been described which differ in neurophysiologic manifestations and clinical application. We feel that with increasing intensities of current, various integrative levels within the brain are reached; starting at the diencephalic level, sub-cortical, motor-cortical (intermediate level of Jackson) and finally reaching the highest centers of mental integration within the frontal and parietal lobes possibly. If such assumption is correct, then in attempting to localize functions within the brain structure, we should use a phylogenetic rather than a topographic approach. It also suggests that phylogenetic

older structures, like the diencephalon, possess a lower threshold for electric stimuli and as we ascend the evolutional scale, excitability for such stimuli diminishes; theoretical implications of this observation will be discussed in a later paper.

Stage one of electro-therapy is non-convulsive and its chief manifestations are autonomic responses and emotional excitations. Its clinical use is indicated in certain anxiety states, paranoid schizophrenia, psychosomatic conditions and in all cases with evidence of depressed brain activity, such as barbiturate poisoning and sudden respiratory arrest during anesthesia.

Stage two of electro-therapy is predominantly tonic in its neurophysiologic manifestations and its clinical applications are still being worked out. It is indicated in the more severe forms of anxiety and paranoid schizophrenia.

Stage three of electro-therapy is identical to electric shock and has the same clinical indications.

Stage four of electro-therapy is tonic in its neurophysiologic manifestations. It seems to affect highest centers of mental integrations. Its clinical use is indicated in the more severe forms of schizophrenia and chronic agitated depressions.

The various stages of electro-therapy may be combined in its application. Not only the total intensity of a current seems to affect the clinical results; pulse-duration and frequency apparently play a certain role. We have gained the impression that an extremely low frequency of 15 to 20 per second with longer pulse-durations of about 1.5 milli-seconds give better results in extremely confused and some catatonic patients. Higher frequencies of about 300 to 500 per second give a smoother convulsion. Differential cerebral stimulation is in its infancy and more clinical experience has to be gathered before final indications for various stages of electro-therapy and various frequencies can satisfactorily be worked out.

The method of electro-therapy described requires greater skill and clinical judgment than the more conventional technics. The patient must be carefully evaluated before a decision is made as to what form of electro-therapy is indicated. Psychotherapy has to be closely integrated. Unlike electric shock, differential cerebral stimulation requires more than "a push of a button." However, the greater skill necessary is an advantage as it places electro-therapy on a higher plane and requires a certain amount of medical art which unfortunately is so often neglected in the routine application of ordinary electric shock.

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Mesantoin In the Treatment of Convulsive Disorders

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At the 1947 meeting of the Southern Psychiatric Association the authors made a report on the use of methyl-phenyl-ethyl-hydantoin (Mesantoin), on 83 patients with convulsive disorders.[1] At that time the average period of treatment with Mesantoin was 3.4 months. In the present report 153 patients were used as a basis for the study. The average period of treatment with Mesantoin was 20 months, the minimum 1 month, the maximum 36 months.

Under treatment with other drugs either at the time Mesantoin therapy was instituted or in combination with Mesantoin later, were 139 cases. The drugs used in various combinations with Mesantoin were: Dilantin, phenobarbital[2] and Tridione. The period of observation varied from 1 month to 168 months with the average period of observation being 20 months.

Without regard to the type seizure from which the patient suffered, the improvement on Mesantoin as compared to other drugs without Mesantoin was:

Improved	89 cases or 64%
No change	29 cases or 20.8%
Worse	21 cases or 15.2%

Age

The average age of patients observed was 24 years 8 months with a minimum age of four months and a maximum age of 58 years. In relationship to the various age groups treated with Mesantoin as compared to other drugs, it was found that in the first decade of life significantly fewer patients showed improvement under Mesantoin and more patients showed an increase in the number of seizures than in the second decade of life. In subsequent decades the average per cent of improvement was approximately the same as in the second decade and the number of patients becoming worse increased slightly.

From the Medical College of Alabama.

Sex and Race

The sex of the patients treated with Mesantoin showed no significant relationship to the degree of effectiveness of the drug. No relationship was found as to the effectiveness of Mesantoin and as to whether the patients were white or Negro.

BREAKDOWN ACCORDING TO SEX

Sex	Cases	No Change		Better		Worse	
Male	87	(19.5%)	17	(69.0%)	60	(11.5%)	10
Female	52	(23.0%)	12	(56.0%)	29	(21.0%)	11

BREAKDOWN ACCORDING TO RACE

Race	Cases	No Change		Better		Worse	
White	125	(20.0%)	25	(65.6%)	82	(14.4%)	18
Negro	14	(28.6%)	4	(50.0%)	7	(21.4%)	3

A comparative study was made of the improvement in the number of seizures as related to the years of duration of the convulsive disorder. Where the seizures had been present for less than 5 years there appeared to be less likelihood that improvement should be expected with Mesantoin than in those where the seizures had been present more than 5 years. Also the cases of less than 5 years duration were more likely to become aggravated under Mesantoin therapy.

Effectiveness in Relation to the Duration of the Convulsive Disorder

Years duration	No. Cases	No Change	Better	Worse
0-5	49	10	29	10
6-10	28	7	20	1
11-15	20	3	14	3
16-20	15	4	10	1
21-25	14	3	9	2
26-30	7	0	5	2
31-35	3	1	1	1
36-40	3	1	1	1

It is of interest that in the first 10 months of administration of Mesantoin, 69 patients or 23% showed an aggravation of the number of seizures suffered as compared to their control by other drugs. However, in 70 cases treated with Mesantoin for a period

of 10 months to 36 months only 7% became worse as compared to the control under other drugs.

This pronounced variation in the percentage of increase in frequency of seizures in these two groups compared on the basis of number of months on Mesantoin, may be attributed to the fact that the patients who become appreciably worse on Mesantoin were taken off the drug too soon. Furthermore, the optimum dose of the drug can be determined only after a period of trial.

Comparison of Months on Mesantoin and Changes in Number of Seizures

Mos. on Mesantoin	No. Cases	No Change		Better		Worse	
1-5	31	(12.9%)	4	(61.3%)	19	(25.8%)	8
6-10	38	(21.0%)	8	(58.0%)	22	(21.0%)	8
11-15	32	(15.6%)	5	(78.1%)	25	(6.3%)	2
16-36	38	(31.5%)	12	(60.7%)	23	(7.8%)	3

When the age of onset was taken into consideration there was no notable relationship found between the age of onset of the convulsive disorder and the effectiveness of Mesantoin in the control of the convulsive seizures.

Relation of Age of Onset to Effectiveness

Age Onset In Years	No. Cases	No Change		Better		Worse	
0-10	70	(24.2%)	7	(57%)	40	(20.0%)	14
11-20	36	(25.0%)	9	(64%)	23	(11.1%)	4
21-30	17	(5.9%)	1	(88%)	15	(5.9%)	1
31-40	12	(8.35%)	1	(67%)	8	(25.0%)	3
41-50	4	(25.0%)	1	(75%)	3		0

Electroencephalograms

In 109 cases electroencephalograms were made before Mesantoin was administered; 15 patients had normal electroencephalograms and 12 of these or 80% later showed improvement under Mesantoin therapy as compared to other drugs. One of these 15 or 6.7% became worse and 2 or 13.7% showed no change. Of 71 cases with abnormal E.E.G. 42 or 59% were improved and 14 or 19% showed aggravation of their seizures under Mesantoin. Twenty-three cases had borderline E.E.G. of which 16 or 70% improved while 4 or 17% became worse and 3 or 13% showed no change under Mesantoin.

Therefore, it is inferred that the more abnormal the electroencephalogram before Mesantoin the less likely is the patient to show improvement under Mesantoin and the more likely is the patient to show an increase in the number of seizures. The more normal the pre-Mesantoin E.E.G., the more likely the patient is to be improved under Mesantoin.

Electroencephalograms

E.E.G. BEFORE MESANTOIN AND RESULTS AFTER MESANTOIN

Type E.E.G.	No. Cases	No Change		Better		Worse	
Normal	15	(13.7%)	2	(80%)	12	(6.7%)	1
Borderline	23	(13.0%)	3	(70%)	16	(17.0%)	4
Abnormal	71	(21.0%)	15	(59%)	42	(19.0%)	14

Results Correlated As to Type Seizure (Total 153 Patients)

Only those patients with a base line of number of seizures under other drugs per month were used in the following comparisons. The number of cases in the various types is not to be confused with the percentage of such cases but are only the cases where the number of seizures could be compared before and after the use of Mesantoin. The classification adheres to that given by Lennox, with only minor variations.[3]

Grand Mal

87 Grand mal cases accepted for comparison.
48 cases or 55% showed improvement to an average of 46% improvement in number of seizures.
32 cases or 37.4% showed no change.
7 cases or 8% became worse to an average 53%.

Psychomotor

32 Psychomotor cases were accepted on the same basis.
13 Cases or 40.7% averaged 63% improvement.
12 Cases or 37.5% showed no improvement.
7 Cases or 21.8% became 34.2% worse.

Focal

29 Cases with focal seizures were used for comparison.
21 Cases or 72.5% averaged 83% improvement.
5 Cases or 17.1% showed no change.
3 Cases or 10.4% averaged 420% worse. (A small number but pronounced aggravation.)

Petit Mal

11 Petit mal cases were acceptable for comparison.
5 Cases or 45.4% averaged 60.4% improvement.
4 Cases or 36.5% showed no change.
2 Cases or 18.2% became an average 96% worse.

Myoclonic

6 Myoclonic cases were acceptable for comparison before and after Mesantoin.[7]
3 Cases or 50% showed no change.
2 Cases or 33.3% averaged 213% worse.
1 Case or 16.7% averaged 19% improvement.

Akinetic

6 Akinetic cases were acceptable for comparison.
4 Cases, or 66.6%, averaged 56.7% improvement.
1 Case or 16.6% showed no change.
1 Case or 16.6% became 150% worse.

Correlation As to Etiology

Idiopathic 58% improved.
Organic 74% improved.

Toxicity

A weighted index of the incidence of toxic symptoms of the various drugs alone or in combination showed:

Ataxia occurred most often with phenobarbital, next most often with Dilantin and least often on Mesantoin.

Dermatitis was most frequent on Mesantoin, second most frequent with Dilantin and least frequent on phenobarbital.

Gingivitis appeared most frequently on Dilantin, least on Mesantoin alone or in combination.

Gastro-Intestinal symptoms occurred most frequently on Dilantin combination, next often on Mesantoin and least on phenobarbital.

Drowsiness, the most common toxic symptom of all the drugs and combinations, occurred most often on phenobarbital and combinations, Mesantoin next in frequency and least on Dilantin. Drowsiness in patients using Mesantoin and its combinations usually occurred early in the treatment, disappearing spontaneously or when the dose was reduced and then gradually increased to the maximum dose over a period of a week or longer.[1,4,5]

One 4 months old patient received .4 Gm. Mesantoin daily for several months through error without untoward effect, but there was control of the seizures.

Table of Results

	No. Cases	Average % Improvement	No. and % Cases	Average % Better	No Change	No. Cases	Average % Worse
Grand Mal	87	22%	48 (55%)	46%	32 (37.4%)	7 (8%)	53%
Petit Mal	11	10%	5 (45.4%)	60.4%	4 (36.5%)	2 (18.2%)	96%
Psychomotor	32	18%	13 (40.7%)	63%	12 (37.5%)	7 (21.8%)	34.2%
Akinetic	6	11%	4 (66.6%)	56.7%	1 (16.6%)	1 (16.6%)	150 %
Myoclonic	6	+71%	1 (16.6%)	19%	3 (50%)	2 (33.3%)	213 %
Focal	29	16.6%	21 (72.5%)	83%	5 (17.1%)	3 (10.4%)	420 %
Other (Tonic)	4		1 (25%)		1 (25%)	2 (50%)	

Dose of Mesantoin

The average maximum dose of Mesantoin on 154 patients was 0.416 Gm. per day.

The average optimum dose on 152 patients was 0.366 Gm. per day.

Other Drugs

The number of patients taking various drugs at one time or another were:

Dilantin	122 patients	or 80%
Tridione	45 patients	or 29.4%
Phenobarbital	107 patients	or 70%
Mesantoin	154 patients	or 100%

The above patients were on these drugs in various combinations with Mesantoin.

Hematology

In 104 patients where blood counts were available no significant blood changes under treatment were seen except in 4 patients who were on Tridione[4]; out of 45 patients on this drug only 4 developed leukopenia; 49 of the 153 patients had no available record of blood counts under treatment.

Weighted Index of Incidence of Toxic Symptoms on Various Drugs Alone or in Combination.

		Dilantin	Mesantoin	Phenobarbital	Tridione
Ataxia	21	95	38	109	91.5
Dermatitis	23	38	65	30.4	14.8
Gingivitis	30	12.9	2.6	8.6	1.6
G.I. Symptoms	7	10.7	2.8	1.4	1.4
Drowsiness	45	58.5	69.0	130	65

Effect of Mesantoin on the Electroencephalogram

These studies revealed that the administration of Mesantoin is frequently associated with the following E.E.G. changes:

(a) Appearance of fast activity in the central regions in the 22-25/second range.

(b) A decrease in the slow frequencies previously present.

(c) Breaking up or decrease in the alpha rhythm. These changes are apparently reversible when the drug is discontinued. Because of these E.E.G. changes on Mesantoin we attempt to always get our E.E.G. before instituting treatment with Mesantoin.[6]

Summary of Statistical Analysis

(1) *Overall effectiveness of Mesantoin as compared with other drugs:*

Total of 139 cases adequately evaluated as to effect of Mesantoin as compared with other drugs.

89 or 64% improved.

29 or 20.8% no change.

21 or 15.2% became worse.

(2) *Relationship of age to comparative Mesantoin control or effectiveness:*

In the first decade of life significantly fewer patients showed improvement and more patients became worse on administration of Mesantoin than in the second decade. In subsequent decades the chances for improvement remain about the same as in the second decade but the chances of aggravation of the disorder increase slightly.

(3) *Sex:* The effectiveness of Mesantoin in control of the disorder does not appear to depend upon sex of the patient.

(4) *Race:* The effectiveness of Mesantoin in control of the disorder does not appear to depend upon race (Negro and white) of the patient.

(5) *Duration of the Convulsive Disorder:* Convulsive disorders of less than 5 years duration appear to be slightly less likely to show improvement, and somewhat more likely to become worse, on administration of Mesantoin than disorders of greater than 5 years duration.

(6) *Duration of Mesantoin Treatment:* In the first 10 months of Mesantoin administration an average of 23% of patients showed an aggravation of the disorder as compared to their control on other drugs; whereas, in the group to whom Mesantoin had been administered from 10 to 36 months, only 7% became worse. The reason for this probably is the fact that: (a) Those patients who became appreciably worse in the first few months were taken off Mesantoin. (b) Optimum dosage had not yet been determined.

(7) *Age at onset:* The effectiveness of Mesantoin in control of the disorder does not appear to depend upon age of onset of the convulsive disorder.

(8) *Pre-Mesantoin Electroencephalograms:* Electroencephalograms were obtained in 109 cases before administration of the Mesantoin. Analysis suggests that the more abnormal the pre-medication electroencephalogram is, the less likelihood of improvement and the more likelihood that Mesantoin may make the patient worse.

(9) *Average Dose of Mesantoin:*

Average Maximum Dose: 154 patients—0.416 Gm. per day.

Average Optimum Dose: 152 patients—0.366 Gm. per day.

(10) *Patients taking various types of drugs:*

Dilantin: 122 patients or 80%.

Tridione: 45 patients or 29.4%.

Phenobarbital: 107 patients or 70%.

Mesantoin: 154 patients or 100%.

(11) *Effect of Mesantoin on the E.E.G.:* Studies revealed that administration of Mesantoin is frequently associated with the following changes in the electroencephalograms:

(a) Appearance of fast activity in the central regions in the 22-25/sec range.

(b) Decrease in slow frequencies previously present.

(c) Breaking up or decrease in the alpha rhythm.

These changes are apparently reversible.[6]

It is the conclusion of the investigators that Mesantoin is a relatively safe anticonvulsant when administered under comparatively simple precautions. The toxic side effects, while few, must be anticipated and necessary measures taken when they appear. We recognize the possibility of changes in the blood picture occurring in comparatively few patients under Mesantoin. This is probably the most hazardous of the side effects and must be appreciated as a possibility.

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Some Interpersonal Processes and Situtations Delaying Discharge From A Psychiatric Institute

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This paper is an attempt to clarify some processes and situations leading to unnecessary prolongation of hospitalization in a psychiatric institute.

Currently, with tremendous numbers of people in need of psychiatric treatment, and psychiatric facilities limited, processes militating against effective rapid intensive treatment and unduly prolonging hospitalization assume considerable importance. Quite often patients resist discharge when the doctor believes it desirable. Again, therapists may resist the advice to discharge their patients when more experienced staff members think it indicated. Not infrequently there is an exacerbation of symptoms at the time of or shortly after discharge from hospital. As these situations occur commonly an attempt to understand the factors involved seemed worthwhile.

A brief description of the setting to which the material is relevant will be helpful for appreciation of this paper. The Institute is a 65 bed psychiatric hospital, attached to the Royal Victoria Hospital, Montreal. The in-patient wards are three in number, a 17 bed male ward, and two female wards of 11 and 15 beds respectively. There is a day-ward for women accommodating 20 patients, and there is accommodation for two men on day ward status. Day patients attend from 9 a.m. to 4:30 p.m. The hospital is voluntary and is an open one. Patients are accepted for treatment of neurotic disorders, early and acute psychoses, and some more chronic psychoses.

On admission patients receive a psychiatric, psychological, biochemical and electro-encephalographic investigation. A considerable range of somatic therapies are employed and psychotherapy ranging from directive suggestive measures to psychotherapy in depth extending over a period of

years is undertaken. There are several group psychotherapy units.

Considerable demands are made on the Institute by the community, with resultant need to maintain a steady turnover of patients. Hospitalization is not commonly prolonged beyond two to three months, most patients remaining in hospital one to two months. Hospitalization aims at freeing the individual from at least the more disabling symptoms, rendering him able to maintain himself in society, where, if required, he can continue treatment as an out-patient.

The factors operative in prolonging therapy and delaying discharge will be reviewed under the following headings:

1. Symptoms, attitudes and needs of patients.
2. Meanings of hospitalization.
3. Social context.
4. The therapist.
5. Prophylaxis and measures to facilitate discharge.

Although this division is artificial, giving a static form to complex dynamic interrelated processes, and involves repetition, it is necessary for purposes of communication. It is obvious that when unnecessary prolongation of hospitalization occurs a number of factors are responsible, and not just a single one of the relevant factors.

1. Symptoms, Attitudes and Needs of Patients.

In general, patients are primarily concerned with their symptoms. Hence inadequate symptomatic relief obviously may produce resistance to discharge.

To consider first symptoms related to *anxiety*—The complaint problem might be of free floating anxiety, panic attacks, somatic accompaniments of anxiety, phobias. If in hospital a course of psychotherapy with any pretension to achieving insights of much significance is initiated, there will inevitably be increased anxiety at periods when conflictual material is mobilized. So a situation can arise in which the patient feels worse until the material has been worked through adequately. Ill-timed probing of conflictual material may produce this state of temporary increased incapacity at a time everybody feels that the patient is about ready to leave.

A second symptomatic state is *depression.* At times the degree of depression is deeper than appears on the surface. The individual may be able to function without much apparent disability in the protected hospital setting, yet inhibition, anergia and lassitude remain and render life outside the hospital too threatening. Thus previously unrecognized disability may become apparent only when discharge is broached.

Further difficulty may be encountered in people with *attention-getting, secondary gain* complaints, particularly the so-called *hysterical personalities.* This group is a very real clinical entity, manifesting characteristic behavior. The hospital setting provides a stage for the display of dramatic symptomatology. The fact of being in hospital, the sympathy of fellow patients and the presence of nurses and doctors is gratifying. These patients frequently attempt to manipulate interested persons by use of their symptoms in order to prolong hospitalization. Firm direction is often necessary.

Behind symptomatic states such as these lie many attitudes and needs, of which only a few of the more important will be mentioned. The needs and attitudes developing in the relationship with the doctor are probably the most important. Frequently observed are the following:

(a) Positive transference:—The development of warm and affectionate attitude to the doctor with overt or covert erotic coloring is not uncommon. There may be unwillingness to relinquish close and frequent contact with the "loved one" if the transference becomes intense, and disinclination to leave hospital on this score.

(b) Hostile attitudes:—Hostility and ambivalence to the therapist, conscious or unconscious, may be operative in resistance to discharge and will certainly delay the progress of therapy prior to discharge. Psychotherapy may become in essence little more than a competition between doctor and patient characterized by attempts of the latter to discredit the physician. There may be a series of crises in the forms of exacerbations of symptoms, acting out, suicidal threats. Again, hostility may be covertly or overtly directed towards relatives, in attempts to prolong hospitalization, to punish emotionally or financially.

(c) Dependence:—The excessive dependent needs of many neurotics are gratified in the doctor-patient relationship and the hospital setting. There are frequently magical expectations of resolution of all problems by simply being in the hospital and passively going through the motions of therapy. Unless disabused of such notions and prepared to take responsibility for themselves such individuals can drift through weeks in hospital without reorientation and resist the relinquishing of their dependent satisfactions when discharge is attempted.

(d) Insecurity:—Insecure people may derive considerable support and reassurance from the doctor and the hospital setting, and be able to function therein with increased efficiency and confidence, e.g. they may be able to handle disturbing relatives adequately, or initiate long delayed and previously too threatening changes in their life situation. But with approaching discharge self-doubt may reappear and the newly-found security vanish, with fear of leaving the supportive setting.

(e) Guilt and fear of disapproval:—Persons who anticipate criticism, feel unworthy, and have guilt stemming from irrational and unconscious sources may fear to face every day life again. This may be verbalized as fear of what people will think of them and how people will behave, now that the patient has been in a "mental" hopital. Such statements may be made by people with high ego-ideal and aspiration level to whom the fact of having been emotionally sick and having sought help of others for personal problems is an insult.

2. The Meanings of Hospitalization.

The meanings will be as numerous as there are patients. However, in general hospitalization means satisfaction of needs for dependence and succor. It means temporary security and emotional support. There is absence from or diminution of the usual stresses and demands of the patient's social and interpersonal situation.

In hospital there are relatively few demands made, other than adherence to a not very onerous hospital routine. Much more is permitted in terms of personal peculiarity and irresponsible behavior than the usual social context allows in most cases—and there is, or should be, an absence of countermeasures to hostile or provocative behavior. There is the solidarity and support of a group of people similarly afflicted. The individual does not feel so different and alone. Group activities and recreation are provided. It is a reassuring and to the majority a hopeful environment. "Treatment" of some kind or other is being carried out continuously. Finally, the environment is administered by tolerant, accepting and to some patients, omnipotent personnel.

3. The Social Context.

The unique situation for each individual may be broken down and discussed under the following two general headings:

(a) Interpersonal aspects:—By this is meant the significant persons, relatives, friends, lovers. Commonly the patient has been in conflict, overt or covert, with one or more of these people prior to admission to hospital. The relatives or others may manifest attitudes and behavior the patient fears or resents. Aggression, dominance, sadism, hostility, rejection, dependence, over-protection may be present. There may be undesired sexual demands on the part of marital partners and others. Alcoholism may be present. These and other threats may be factors rendering a patient unwilling to leave hospital, whether they are clearly recognized as such or not.

(b) Demands of everyday life and concrete living conditions:—On leaving the hospital the patient must assume more responsibility for himself and for his relationships with and obligations to others. For most there will be the necessity for work, in the home, or in earning a living. Some patients may wish to prolong the irresponsible dependent patient status, being unwilling to deal with the tasks of housework, caring for children, getting back to an occupation, or finding a new one. To some the relative luxury and ease of hospital life contrasts with taxing and sometimes squalid living conditions at home or in lodgings—hence a reluctance to leave.

The significance of the preceding two sections as they affect therapy is the distortion of the clinical picture the hospital setting

may produce. In the artificial, buffered hospital situation, stresses such as are outlined above are greatly reduced. One is not observing an individual reacting to the usual stresses of his everyday existence. So there is a possibility that the doctor may remain unaware of important factors in the reaction, these perhaps not becoming apparent until discharge approaches. Then they may show up as accentuated symptoms, rationalizations for remaining in hospital, as well as direct evidence of what is actually the disturbing agent.

4. The Therapist.

There are three aspects in the doctor's role in prolonging hospitalization.

(a) Counter-transference:—The therapist is never neutral. He brings his attitudes, value-judgments, needs, conflicts and anxieties into the two-way relationship with the patient. The above will influence his behavior in the therapeutic relationship with the patient which will in turn influence the patient's behavior. In the event of a positive counter-transference developing there may be a frank liking for the patient, with or without obvious erotic elements in the relationship. The counter-transference may be obvious, and clearly recognized, or it may not be, but will be evidenced by statements such as "A very interesting case"; "Working exceptionally well in psychotherapy," etc.

Apart from identification with patients with similar ego-ideal, outlook and problems, and the erotic needs of therapist, other needs may be satisfied in the relationship, such as needs for dominance, aggressive drives, or masochistic trends.

If the relationship is "positive," i.e. satisfying to the doctor, hospitalization may be prolonged by him, or he may readily fall in with the patient's desire to remain longer in the hospital.

If a "negative" relationship develops the process may be reversed and lead to discharge of a patient before the appropriate time. For example, a physician may be rendered anxious by a hostile patient because of arousal of his own hostile and sadistic impulses and may reject the patient early. Or another resolution may be efforts to appease and placate potentially hostile persons with smothering of the needed awareness of and expression of hostility to the doctor as a representative of a significant person or persons in the patient's past.

Finally one should mention that the development of a positive transference to the physician is flattering to the inexperienced, and to those who need to feel power over people, and may lead the doctor to prolong the ego-bolstering relationship unwittingly.

(b) Anxiety, frustration and guilt:—In a therapeutic setting where the aspiration level is high, where many of the clinical problems are difficult, where there is pressure to maintain a rapid turnover and produce results in a fairly short time, and where some members of the staff are in training and not yet secure in dealing with the complexities of therapy, anxiety, guilt and frustration inevitably arise. The discrepancy between aspiration-level- (often unrealistically high) and achievement can result readily in the phenomena noted.

This has important clinical implications, quite apart from other undesirable aspects of such developments. Anxiety and depression impair clinical acumen and the doctor's efficiency as a therapeutic tool in psychotherapy. It is difficult to be supportive and reassuring if one is depressed oneself. If the patient does not improve, or deteriorates, the doctor may feel it is all his fault and develop a "My God what can I do now?" attitude. He will then have recourse to a series of treatments, some of them perhaps not indicated, producing no beneficial results and prolonging hospital stay to no purpose.

(c) Lack of definition of the problem:—The lack of a clear definition of the complaint problem, the reasons for hospitalization, current phenomena, defenses, conflicts, needs, environmental factors, precludes a reasonable prognosis, tentative formulation of dynamics and definition of the possibilities and goals of therapy. The doctor will then be operating in the dark, perhaps attempting insight psychotherapy with individuals incapable of benefiting by such a procedure, or using a somatic therapy where there is little indication for it. The papers

of Whitehorn and Powdermaker are excellent guides in this respect.

5. *Prophylaxis and the Measures to Facilitate Discharge*

In managing these problems, the following measures seem to be important,

(a) Definition with the patient on admission of the complaint problem, reasons for hospitalization, what therapy entails and its possibilities. This is an essential step in effective relatively short term hospitalization. Frequently patients come to hospital with grossly unrealistic personally and culturally derived notions of psychiatric treatment. There may be expectation of a magical and painless extraction of the difficulties, or on the other hand a fear of barbaric therapies. It should be pointed out where possible that hospitalization is only one incident in a series of events, an opportunity to review problems and conflicts and to evolve new ways of handling anxiety-laden aspects of living. It should be made plain that active cooperation is essential for any lasting benefit to be derived from the period in hospital. Much explanation may be necessary to clear many misconceptions, and many are not amenable to explanation. Every effort should be made to orient the individual to using his stay in hospital productively.

(b) Throughout therapy, particularly when time is limited, current reactions and realistic factors must be kept in mind. Otherwise patient and doctor may wander hand in hand through the fields of early psychopathology, leaving the current neurotic patterns untouched.

(c) The total problem should be appraised as fully as possible shortly after admission. Necessary additional information from relatives and friends should be obtained early. If this is done at the outset a fairly adequate formulation can be made, operating in the dark will be prevented and much time and energy may be saved.

(d) Social service assistance should be requested at the beginning of hospitalization. The worker can then establish better relations with patient and relatives, perhaps work with relatives as part of a treatment plan, assist the patient in job placement if necessary, and in general ease the difficult discharge period for the patient.

(e) Discharge should be planned ahead, and not suddenly sprung on an unprepared patient. Approximately two weeks prior to the anticipated time is fair enough and gives time for discussion of anticipated difficulties. Previously unrecognized factors may come to light, leading to revision of earlier formulation of the situation.

(f) Psychodrama or role-playing of relationships and situations anticipated as difficult may be useful. There may be a desensitization of anxiety-fraught areas, with increased confidence and security.

(g) A discharge group is a useful adjunct. In the Institute there are weekly group meetings of patients nearing discharge, and some of those who have recently been discharged.

(h) Adequate support of doctors developing anxiety and guilt in relation to their patients is essential. There should be ample time and opportunity for psychotherapists in training to communicate with those more experienced about therapeutic, and if necessary, personal problems. It is chiefly by such communication and support that the young doctor regains his security and learns effectively.

(i) Therapists should be aware of and scrutinize their reactions to patients and the reasons for the production of anxiety and hostility in them by patients. Unless the doctor realizes he is a "participant observer," to use Sullivan's term, and not a detached completely objective being, he will be an ineffective tool in the resolution of his patients' difficulties.

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Psychiatric Effects of Diabetes Occurring Late In Life

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Descriptions of the personality of the diabetic generally make no distinction on the basis of the patient's age at the onset of the diabetes. The following study was done on a group of individuals who developed to chronological maturity without the factor of diabetes to consider. The effects of their past behavior, as it related to their developing diabetes, and changes in the personality following the detection of the diabetes were sought. Since recent studies have emphasized the effects of emotion in the production and prolongation of somatic disorders, the need for psychiatric treatment as an adjunct to routine diabetic care was evaluated.

Method

Nineteen of the patients studied were from the Out-patient Diabetic Clinic; six were hospitalized patients. The only factor considered in the selection of the individuals was their age at the time of the detection of their diabetes; the youngest age included was 35. The patients were equally divided as to race, half being white and half colored.

Twenty-five cases were studied. The average age at the detection of the diabetes was 48.8 years, and the average time since the diabetes was diagnosed was about 4.2 years. The patients were usually seen for a one hour interview; a few for a maximum of three interviews. The method used for selection of the out-patients was simply to include those who fitted into the age group and were patients in the Diabetic Clinic. The cases in the hospital wards were seen on a consultation basis, usually because they showed overt neurotic symptoms, while among the out-patients the greatest cause for referral was obesity and/or consistent failure to stay on the prescribed diet.

The patients studied were all from a free clinic or free beds in the wards and their economic status was marginal. None were screened for lack of intellectual endowment. Four were of apparently dull-normal intelligence, but none were feeble minded.

There appeared to be two types of response to adversity in these patients. In six patients, overt and typical neurotic symptoms were seen. These symptoms were similar to those seen in other neurotic individuals who were not diabetic and reference to the diabetes as such was not included in the symptom complex. The common complaints were insomnia, lump in the throat, parasthesias of hands and feet (without other evidence of neuropathy), band-like headache, and palpitation.

There was a striking difference in the concern about symptoms shown by the two groups. The neurotic group was quite concerned while the larger group showed relatively little affect when describing themselves. The type of response the patients demonstrated could not be correlated with the onset of their diabetes, nor was the lifelong pattern of response markedly altered by detection of the diabetes.

In only one case was it established that a definite emotional trauma immediately preceded the detection of the diabetes. In this case, a 50 year old colored woman had planned to marry a man for five years and was then jilted, following which she became depressed, easily fatigued, and unable to work. In a routine examination, she was found to be diabetic. However, the patient had shown previous emotional instability and had been briefly hallucinated in the past. These hallucinations, both auditory and visual, were religious in nature and had not unduly disturbed the patient.

Of the 25 patients, two were single and the remaining 23 had married a total of 27 times and had 57 children. Twenty-eight per cent had relatives who were diabetic. Seven married women complained of their husbands being alcoholic and this was the cause for divorce most frequently given. Sexual frigidity was found in four of the 19 women, and one of the five men had been impotent for one year. The women who complained of frigidity stated that this dif-

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ficulty had been most marked during the first few months after marriage and had then ceased. It had recurred in two cases when they found their husbands were unfaithful. In only one patient was there a spontaneous complaint of gynecological difficulty, and this was a case of pruritis vulvae which occurred before the diabetes was controlled. The man who was impotent had lost one testicle following a gunshot wound as a boy, but had retained sufficient function of the remaining testicle to acquire gonorrhea. His impotence was part of a generalized debility which included radicular pain, incontinence and other evidence of diabetic neuropathy.

None of the women complained spontaneously of symptoms usually attributed to the menopause, nor was there a history of their being unduly incapacitated following the birth of their children, although eight of them stated they had been "torn" during delivery. Their sexual drive was not marked, but the decrease in sexual activity was difficult to evaluate due to the large number that were no longer married and to their average advanced age. One colored woman claimed that the diabetes caused her to lose her "nature" and described her present aversion in the same manner in which she claimed to react when offered candy, by saying it made her mad to even be tempted by it because she always refused. She was 20 pounds overweight.

Six of the patients had made poor social adjustment; three of these were in the group which showed overt and marked neurotic symptoms. During their adult life prior to the time they became diabetic they had few interests and few friends outside their immediate family. This situation was not altered by their development of diabetes. The group as a whole was moderately unsuccessful financially and socially; they were in the low income group, none had attended college, and none had developed any avocation. Their two main activities consisted of attending church and the Diabetic Clinic. Sixty per cent were regular in their attendance at church but demonstrated no great concern over righteousness. There was little other outside activity, and when they were asked how they spent their leisure time the most frequent response was "reading the paper and listening to the radio."

The patients in both groups had marital difficulty which led to the female patients' assuming the responsibility of the family in 46 per cent of the histories. In only two of these women who supported themselves and their families, which included from two to eight children, was there evidence of neurotic complaints or incapacitating emotional symptoms. Several stated that the only change they had noticed since the onset of their diabetes was an inability to work as rapidly and as persistently as they previously had. Two of the patients had twin siblings but neither had become diabetic although their background had been similar; in neither case was the twin available to determine if they were identical.

There was little apparent worry over the fact that they were diabetic and this was considered one of the main difficulties about keeping them on their diet. The patients failed to see the need for maintaining their weight at the proper level provided their Benedict's test continued blue or green. They would admit to some dietary additions after the interview had progressed but would frequently add, "but my urine test has been blue all the time." Seven individuals who were each more than 30 pounds overweight were careful to explain that all their family had been "big people" and they did not feel their weight gain had any close relationship to their diabetes because the non-diabetic members of their family were also obese.

In only one of these seven patients was there observable evidence of depression and neurotic complaints. This patient had been very dependent on her mother and had never married because "no man could ever do as much for me as mother did." This patient had cared for her mother until the time of her death which occurred after the onset of diabetes. She lived alone and her only social activity was a monthly visit to the clinic. She was not friendly with the other siblings and she resented their previous lack of interest in the mother. This patient gave a history of having been obese for several years and claimed that since she had been taking insulin she was hungry all the time but denied over-stepping her diet. In this

instance it was felt the over-indulgence in food may have been an expression of a need for affection following the mother's death as well as the effects of the insulin.

Discussion

Twenty-five patients were interviewed psychiatrically to attempt to evaluate their response to diabetes occurring after maturity. The group was found to be composed of two types of individuals. There was a larger group without neurotic symptoms and with minimal concern over their condition, and all of these nineteen patients were overweight. The lack of concern shown by the patients for their condition was thought to be a very important factor in their not staying on their diet; and the goal of psychiatric treatment in this overweight group was to create some degree of anxiety in the patient and relate it to their eating. There was a smaller group of six patients who had typical symptoms, usually classified as neurotic, with a very marked concern over these symptoms which did not include their diabetes. In this group the neurotic complaints were longstanding and it was not considered unusual for them to fail to incorporate the diabetes in their symptom complex.

No consistent pattern of behavior was noted in these patients that would have enabled one to predict their likelihood of becoming diabetic prior to the time it was clinically discovered. The development of this altered metabolic state caused no appreciable change in the behavior of these patients whether or not they had been neurotic before the diabetes was detected.

It was felt that there was a need for a psychiatrist to work in conjunction with a Diabetic Clinic to treat neurotic diabetics and to aid the internist in creating sufficient concern in the overweight group to have them follow their prescribed medical routine. The findings of Dr. Flanders-Dunbar[7] in her colored patients that they were "relatively inarticulate and poor observers of themselves" was not confirmed in this study.

Conclusions

1. On gross and brief examination these 25 patients who had developed their diabetes after reaching maturity failed to show responses occurring with sufficient frequency to delineate a "diabetic personality." No marked change in the individual personality as measured by the history of their behavior was demonstrated after they became diabetic.
2. Six of the 25 patients studied showed neurotic symptoms which antedated the detection of their diabetes and their symptomatology was not altered by the diabetes.
3. An apparent absence of concern over being diabetic was noted in nineteen of the patients seen. This group was overweight and their attitude toward their condition was thought to be the reason they did not adhere to their prescribed diets.

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Use of Music With Electro-Convulsive Therapy

(Preliminary Report)

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Poets have long recognized the effects of music upon the emotions. In ancient Greece poetry was always sung. The Canadian poet, Archibald Lampman, in his poem, "The Violinist," by the following lines:

> "Through the great and silent crowd
> The music fell on human ears,
> And many kindly heads were bowed
> And many eyes were warm with tears."

communicates the power of music to influence the emotions.

The use of music in medicine began in biblical days when the strains from David's harp aided in causing a remission of Saul's depression. Later the Egyptians used incantation for healing purposes. Among the pioneers in music therapy were Pythagoras, sometimes called the "Father of Experimental Psychiatry," Aristotle, Plato, Empedocles, Aristoxenus, Polybius, and Hippocrates, who in 400 B.C. took his mental patients to the temple to listen to music. Aristoxenus of Tarentum can be considered the first music psychologist because he went beyond the question of the origin of sound and investigated the problems of perception of sound by the human ear.[1] For a thousand years thereafter little progress in music therapy was made. The Arabs in the thirteenth century installed music rooms in their hospitals. The reason for this slow progress has been suggested by Licht[2] who points out that "musicians and physicians are independent people, brooking no outside interference. There are those on both sides who would protest their marriage, not so much from a concern over connubial bliss as over the possible offspring and undesirable relatives." Except for Pargeter, an English alienist of the eighteenth century, who continued the plea of Pythagoras for a specific music therapy and who used music on a therapeutic basis, progress in music therapy was slow and unspectacular.

In 1942 Dr. Howard Hanson[3] at the annual meeting of The American Psychiatric Association stated that "music in its relationship to the emotions presents several fascinating fields of study, none of which have been widely explored." Since then much exploration in this field has been carried out; outstanding has been Dr. Ira M. Altshuler[4] at Eloise, Michigan. Dr. Altshuler emphasizes the influence of music upon the hypothalamus and the thalamus, the relay station of all emotions, sensations, and feelings. With musical stimulation of the thalamus the cerebral hemispheres are stimulated automatically by the radiating fibers from the thalamus. Even when mental patients cannot be reached by verbal contact because of their confusion or depression, musical tones can reach the thalamus and thereby the cerebral hemispheres, and so a closer contact may be made between the cerebral hemispheres and the outside world. Dr. Altshuler has also pioneered with the "iso" principle and the musical prescription with the sequence: rhythm, melody, harmony, mood, and pictorial-associative music.

The psychoanalytical contribution to music therapy has been discussed by Tilly.[5] She indicates that the relative strength of the Anima to be the same in both the personality of the composer and his work; moreover, she is convinced that the most favorable response to music is achieved when the strength of the Anima approximates that of the listener. This seemed to be true regardless of the sex or the mental condition of the individual. Thus the schizophrenic will react according to his basic type; e. g., a male patient in whom the masculine principle is weak will prefer music strongly feminine in character. Diserens[6] tells of the psychoanalyst, Mosonyi, who believes that "music in its original form arises from pain as an irrational expression of a powerful instinct inhibited in other directions. Primitive music is often in a minor mode, which would therefore seem to be a natural expres-

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sion of pain and melancholy." Montani[7] writes that "with the minor mode are associated the feelings of suffering, chastisement, and pain which characterize reactions to the castration complex." Coriat[8] suggests that it is the narcissistic gratification which is sought as the result of the release of fantasy that is the key to the emotional effects of music. Coriat suggests further that some sounds may represent sublimitation of anal-erotic interests.

In view of the use of music with electroshock, further investigation of the relationship of music to convulsions as in reflex epilepsy or musicogenic epilepsy is indicated. Bing[9] mentions the strange story of the writer, Nikonov, who had severe fits upon hearing classical music; certain epileptics go into attacks only when jazz or an accordion is being played. Critchley[10] describes eleven cases of musicogenic epilepsy.

Continuing the progress of and research in music therapy is the National Association for Music Therapy.

During the past 6 months music has been used with electro-convulsive therapy at the Mayview State Hospital in an attempt to determine its value and to compare the results with a group of patients who received electro-convulsive therapy without music. The suggestions for the selection of music and the techniques as employed at the Sheppard and Enoch Pratt Hospital have been used as a guide.[11] The patients were given E. C. T. 4 times per week. The average number of patients per treatment day has been 20. The patients in this series were: 72% schizophrenics, 10% manic depressive psychotics, 10% involutional psychotics, and 8% organic psychotics with depression. The E. C. T. machine employing Liberson's "brief stimuli" technique was used. In a subsequent report we shall note the effects of music with E. C. T. on the specific psychiatric diagnoses. Music was played during the three periods of treatment: 1) preparation, 2) return of consciousness, and 3) the after-period which includes a half hour of bed rest in the treatment room.

The impressions of the effects on patients who had music with E. C. T. as compared with patients receiving E. C. T. without music included:

I. During the preparatory stage:

A. Decreased fear of E. C. T. and thereby decreased resistance to entering the treatment room were recorded. Preston[12] has also noted this effect and writes that the music overcame the patients' fear.

B. The morale of the patients as a group was boosted. The classical records may have been influential in increasing the morale of the patients for Mitchell and Zanker[13] point out that the "classical style tends to provide security through its formal structure to all patients irrespective of clinical type. There is often a marked increase in group cohesion while listening to this style, probably due to the cosmic character of some of these great composers." A year after this original observation Mitchell and Zanker[14] confirm that classical music is uplifting and integrating and gives more security through its firm, formal structure and emotional control.

C. Easing of tension of patients by elimination of the dead silence which occurs when patients are prepared for shock.

D. There have been no suicidal attempts among the patients on E. C. T. with music while there were 3 such attempts during the 6 months prior to this present study when the patients were on E. T. C. without music. All 3 suicidal attempts occurred during the preparatory stage, 10-15 minutes prior to entering the treatment room.

II. During the return of consciousness:

A. A more rapid return of consciousness.

B. A decrease in the amount and duration of moaning and terror-manifesting reactions.

C. Restlessness and rolling movements were diminished in number and intensity.

D. Coitus movements in women with masturbatory manipulations were reduced in number. Some of the women who exhibited this phenomenon prior to the introduction of music no longer did so after music was used with E. C. T.[15]

III. During the after-period:

A. A decrease in confusion was noted.

B. A decrease in the number of complaints of headache, dizziness, and nausea compared with patients who received E.C.T. without music was recorded.

C. As a group the patients were more pleasant and cheerful. We can agree with Preston[12] who noted a "calming and assuring influence when consciousness returns. It soothed and relaxed the patients thus making it easier for them to sleep or lie quietly. The atmosphere of the entire ward was changed for the better."

D. Toward the end of the after-period many of the patients were enthusiastic in wanting to go to the hospital activities as Occupational Therapy and the Recreation Department. Music may reduce or delay fatigue and consequently increase muscular endurance.[6]

E. The quieting effect noted during the after-period has persisted and thereby resulted in a reduction in the amount of sedation ordinarily required on the wards prior to the use of music with E. C. T. Altshuler[16] writes that "specially selected and specially played music produces a quieting effect. Upon disturbed patients it is 35% more effective than the wet sheet pack." Altshuler has also observed that music can temporarily replace hallucinations, redirect aggression, decrease tension, and soften hostility. Harrington[17] noted the quieting effect of music used in a mental hospital while patients are eating. He writes that "towards the end of the meal I have often seen this large group of patients perfectly quiet. I am convinced that the quietude is due to the music, the effect of which is produced by a passive reception of the reposeful musical tones."

F. There has been a decrease in the number of patients exhibiting psychotic excitement while on E. C. T. with music; therefore, fewer patients now require coramine usually used with E. C. T. in the treatment of psychotic excitement as described by Fabing.[18] Mann[19] notes that "because of its direct appeal to the emotions, music has the power to recall past experiences and bring back into the minds of disturbed patients a basic reality which acts as the bridge between the patient and the outer world."

G. Post-convulsive excitement has been diminished in intensity and the number of patients exhibiting this phenomenon has decreased. Kalinowsky and Hoch[20] discuss the post-convulsive excitement immediately following the convulsion, which may last from a few minutes to one-half hour. Some patients become assaultive, try to escape, or run around and injure themselves. The treatment of this reaction is prophylactic; its recurrence may be prevented by intravenous injection of sodium amytal immediately prior to administration of E. C. T. It has been our experience that music used with E. C. T. diminishes post-convulsive excitement and in some patients eliminates the need for sodium amytal.

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Pulmonary Tuberculosis and Frontal Lobotomy

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A recent progress study[1] of 330 lobotomized patients indicated that tuberculosis constituted a prominent mortality factor in this group. Thus tuberculosis was the primary cause of death in 5 of 20 deceased patients. In only one of these individuals was tuberculosis known to be present prior to lobotomy. Four patients, all female, died of pulmonary tuberculosis respectively 7 months, 19 months, 22 months and 3 years postoperatively. The author concluded that in these cases lobotomy may have led to reduced resistance of the organism with resultant development of tuberculosis. Unfortunately, it was not specifically indicated whether routine x-rays of the chest were taken preoperatively and at the time of the follow-up study. However, as indicated, the author implied that frontal lobotomy is not helpful to individuals with pulmonary tuberculosis and may initiate or aggravate that process.

This rather serious implication does not agree with the clinical impression gained previously by the present authors[2] or by Freeman and Watts.[3] The latter reported gratifying results from lobotomy in a group of disturbed, tuberculous, schizophrenic patients. We have also expressed the opinion that frontal lobotomy may be especially indicated in such patients as these individuals frequently present difficult therapeutic problems. Management of these patients offers complexities in that shock therapy is usually contraindicated in the presence of active pulmonary tuberculosis; the patients' overactivity prevents adequate healing of the tuberculous condition; and they constitute a marked hazard to attending personnel because of their uncooperativeness with the usual hygienic measures required in tuberculosis. Frontal lobotomy appeared to effect gratifying alteration in the behavioristic reactions of these patients, and it seemed reasonable to assume that the diminished physical activity, gain in weight and emotional calmness which frequently result from lobotomy would be followed by improvement in the tuberculous condition.

In view of the contrary opinion implied by Stengel,[1] it seemed pertinent to report the results of a specific review of this problem.

The program of frontal lobotomy was initiated at the Fairfield State Hospital in May 1946. A total of 251 operations has been performed on 245 patients. All patients had roentgenographic examination of the lungs as part of the preoperative study, so that a satisfactory baseline was available. During this period of almost five years routine biennial tuberculosis surveys have been conducted at this hospital. Except for those with known tuberculosis no lobotomized patient was reported to have active tuberculosis during these surveys. This offered strong presumptive evidence that lobotomy did not cause lowered resistance and thereby increase the incidence of tuberculosis.

A further check was made at the time of the present report. Operations in 10 of the 245 lobotomized patients were too recent to permit adequate follow-up study. For the 235 remaining patients periods of 8 months

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to 4 years, 9 months had elapsed postoperatively, thereby permitting satisfactory progress reports. Of these 235, there were 142 in the hospital at the time of the present investigation. These patients ranged in age from 20 to 69; 70 per cent were female and 30 per cent male; 88 per cent suffered from dementia praecox. These statistics corresponded closely with those of the lobotomized group as a whole.

Roentgenological examination of these 142 patients failed to reveal any new cases of pulmonary tuberculosis. The condition of 6 patients, who had exhibited evidences of healed, inactive tuberculosis in their preoperative and previous x-rays, remained unchanged, without any evidence of reactivation.

Two patients in this group had active tuberculosis when they underwent lobotomy operation. One has exhibited considerable improvement in her pulmonary condition. The other showed progressive improvement over a period of approximately 3 years following operation; his disease appeared stable and he was permitted to leave the tuberculosis ward. During the past month or two, however, he has again revealed some evidence of instability, which required his return to the tuberculosis unit. However, the chest film shows evidence of considerable improvement in comparison with the preoperative x-rays.

Two other actively tuberculous patients have undergone lobotomy operations. One left the hospital, against advice, approximately one year postoperatively and consequently he was not available for recheck during the present study. However, at the time of his release from the hospital his pulmonary condition was regarded as definitely improved by our tuberculosis consultant. Operation on another actively tuberculous patient has been too recent for proper follow-up evaluation. All these tuberculous patients have been benefited mentally by the operation.

Aside from immediate postoperative mortality, there have been 8 deaths in our series of 245 patients. Four of these were characterized by delayed postoperative death, as described by Meyer,[4] with marked depletion of physical reserves, inertia, muscular rigidity and contractures, weakness, irregular fever and, finally, extensive decubitus. Reduced resistance of the organism was certainly present in these cases. Postmortem examination, which was performed in all these cases, failed to reveal any evidence of pulmonary tuberculosis. Autopsy findings were also negative for tuberculosis in two other patients who expired of causes unrelated to the lobotomy operation. There was no clinical or roentgenographic evidence of tuberculosis in the other two patients who expired but on whom postmortem examination could not be performed.

We believe that it would be of interest to compare the preceding data with observations in other patients. Two control groups were available for comparison with the lobotomized patients. The first was, of course, the general population of the hospital. Roentgenograms of the entire hospital population were not taken at the time of this study; however, as indicated previously, routine biennial chest surveys have been conducted. The incidence of new, active, tuberculous cases discovered in these surveys has been approximately 0.8 per cent for each biennium. Accordingly, in a group of 142 patients selected at random one might expect the appearance of 1 to 2 new cases of active tuberculosis during the period in which the lobotomy group has been followed, i.e. 8 to 57 months. As already indicated, the observed rate among the 142 lobotomized patients was zero.

A second, more specific control group was composed of a "control" series of patients previously described.[5] This consisted of a group of patients who were originally selected by the clinical staff as desirable subjects for lobotomy operation but for whom operative permission could not be obtained from the family. These individuals corresponded closely with the operative group in all clinical aspects. Originally this control group contained 77 subjects; 4 of these were later lobotomized, thus leaving 73. At the time of the present study 64 individuals were available, as 6 patients had expired and 3 had left the hospital. Roentgenographic study of these 64 patients at the present time did not reveal any new cases of pulmonary tuberculosis. However, two cases

with previously known active tuberculosis exhibited progression of the disease. In addition, pulmonary tuberculosis was the primary cause of death in two members of the original control group of 73 patients. In one the disease was present when permission for lobotomy was requested and refused and in the other it developed approximately a year thereafter. Thus 2 of the 6 deaths in the control group of 73 individuals were due to pulmonary tuberculosis. It is of interest to record that in the lobotomy group the mortality, including immediate postoperative, and later deaths, has been 5.6 per cent thus far, as compared with 8.2 per cent in the control group.

Conclusions

The data presented above do not confirm the implication conveyed by Stengel that frontal lobotomy, through reduced resistance of the individual, may initiate or aggravate pulmonary tuberculosis. On the contrary, it has been our experience that, in appropriate cases, lobotomy is definitely helpful, both physically and mentally, to tuberculous, psychotic individuals. Prior to lobotomy, the tuberculous patients who underwent this procedure were hostile, overactive, destructive and uncooperative. In general it was impossible to impose the care required in the treatment of their tuberculous condition, and accordingly, their pulmonary lesions were not responding satisfactorily, despite streptomycin and other chemotherapy and, in one case, artificial pneumothorax. Gratifying results followed lobotomy operation. These patients became emotionally calm, physically composed, and cooperative in all respects with the necessary tuberculosis regimen. Increased appetite and gain in weight, which are commonly observed in postlobotomy patients, were especially desirable in these cases. In contrast, the tuberculous patients for whom operative permission was refused, have expired or have exhibited progression of their disease.

As indicated, lobotomy did not cause any reactivation of disease in those patients with healed, inactive tuberculous lesions. The incidence of newly discovered cases of tuberculosis in the lobotomized group during the period of observation was zero, and obviously less than that of the general hospital population, in which an incidence of approximately 0.8 per cent per biennium was discovered.

We wish to repeat our previous opinion[2] that frontal lobotomy is especially helpful in tuberculous, chronically psychotic individuals, and that it is the treatment of choice in disturbed, tuberculous, schizophrenic patients.

Summary

The results of this study indicate that frontal lobotomy does not lead to increased incidence of pulmonary tuberculosis in mentally ill individuals. On the contrary, the procedure is definitely helpful, both mentally and physically, particularly in the case of disturbed, tuberculous, schizophrenic patients.

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